

Initial	Date
CW	5/13/88
Rue	5/13/88
WJR	5/13/88
LC	5-13-88

BA/EN
WR SD
Mail Stop 60190

MAY 13 1988

Memorandum

To: ARD-Refuges and Wildlife (60130)
Attention: Jim Matthews

From: Regional Engineer, Region 6

Subject: Annual Water Management Plan-Lake Andes National
Wildlife Refuge

The subject reports for Lake Andes NWR, Karl Mundt NWR, and Broken Arrow WPA have been reviewed and approved as submitted.

Please extend our thanks to refuge personnel for the timely submission of this report.

/s/ WILLIAM A. GOOBY

bcc:EN Rdg File
Circ File
RD
EN:LCo:lc:05-11-88

1988 ANNUAL WATER MANAGEMENT PLAN
AND
1987 WATER CONDITIONS AND USAGE

LAKE ANDES NATIONAL WILDLIFE REFUGE COMPLEX
LAKE ANDES, SD

WATER UNIT: Lake Andes

I. Introduction

Lake Andes is a 4730 acre meandered lake whose water level depends entirely upon annual runoff. Two dikes cut the lake into three units, the North, Center, and South. Stop log water control structures are located within each dike, however, the lack of a permanent water supply precludes any water level manipulations.

Drainage area size and surface acres for each unit of Lake Andes are shown below. Maximum and average depth figures were determined in 1962.

Unit	Drainage Area Acres		Surface Acres of Water	Water Capacity (Acre Feet)	Depth/full	
					Max	Avg
South	20,000	24%	1,760	16,159	13.5	11.5
Center	11,000	14%	2,359	18,000	14.5	12.9
North	<u>53,000</u>	<u>62%</u>	<u>611</u>	<u>3,015</u>	<u>10.5</u>	<u>9.1</u>
TOTAL	84,000	100%	4,730	37,174	--	--

In 1922, Congress passed a bill establishing a high water elevation of 1437.25 feet msl for Lake Andes via the construction of an artificial outlet on the South Unit. This level was established following local complaints about flooding around the lake. The Fish and Wildlife Service received the right to flood the meandered lake bed of Lake Andes in an easement taken in 1939 from the State of South Dakota.

II. 1987 Water Conditions

In 1986 Lake Andes filled for the first time since 1962 and remained a full pool elevation through the winter of 1986-87. A mild, open winter allowed ice-out on Lake Andes on March 1. Three inches of rainfall on March 15-21 raised all pools to 1438.91 feet msl. On March 26 the North and South dikes were covered with water. Lake elevations continued to rise until levels reached a

REFUGES & WILDLIFE

peak of 1441.09 feet msl on April 3. The excess water continued to drain through the outlet structure until it reached the set high water mark of 1437.25 on September 1. The lake elevation at freeze-up was 1436.8 feet msl.

<u>Date</u>	<u>1987 Lake Andes Water Levels - Feet MSL</u>		
	<u>North Unit</u>	<u>Center Unit</u>	<u>South Unit</u>
03/01	Ice Out		
03/05	1437.4	1437.4	1437.4
03/22	1438.91	1438.91	1438.91
04/30	1440.42	1440.42	1440.42
06/01	1439.01	1439.01	1439.01
06/15	1438.45	1438.45	1438.45
07/07	1437.87	1437.87	1437.87
07/31	1437.62	1437.62	1437.62
08/10	1437.54	1437.54	1437.54
09/03	1437.20	1437.20	1437.20
09/30	1437.30	1437.30	1437.30
10/30	1437.03	1437.03	1437.03
12/01	1436.80	1436.80	1436.80
12/15	Freeze Up		

III. Ecological Effects of Increased Water Levels In Lake Andes

In 1987, Lake Andes habitat conditions remained very similar to that of 1986. The rapid increase in water levels in 1986 drowned out approximately 95% of the cattail stands and eliminated much of the production of submergent vegetation. In 1987 submergent species recovered somewhat but, production was far below average because of the deep water conditions.

Waterfowl breeding pairs totaled 787, up by 57% from 1986. This compares to a peak of 1326 pairs in 1983 when Lake Andes began to fill after a period of drought. The deep, open water habitat with few emergents provided less than ideal pair and brood habitat. This "big lake" situation delayed freeze up and provided late migration habitat for mallards and snow geese.

Large numbers of colonial tree-nesting birds such as black-crowned night herons, snowy egrets, cattle egrets and great blue herons nested in flooded Russian olive trees in Owens Bay.

The high water conditions continued to benefit the Lake Andes sport fishery. Excellent populations of largemouth bass, yellow perch and bluegill exist in the North and Center Units. In 1987, a contract was issued to a private fisherman to commercial fish bullheads. It had been determined by fishery biologists that recruitment of game fish species was limited by the high bullhead populations.

The potential for a fish winter kill, generally a problem on Lake Andes, has been reduced significantly by the deep lake conditions.

IV. 1988 Water Management Objectives

Management objectives for 1988 are to contain as much runoff as possible in Lake Andes. Water in excess of the 1437.25 elevation mandated by Congress will continue to be released from the outlet on the South Unit.

WATER UNIT: Owens Bay

I. Introduction

The Owens Bay Unit is a 240 acre marsh unit, separated by a dike from the South Unit of Lake Andes. A stop-log water control structure is located in the dike to allow water releases into Lake Andes.

Owens Bay, in addition to water from natural runoff, is maintained by a free flowing artesian well. The well, drilled in 1957, originally had a 1000 gpm flow and water right. Well shutdowns during the 1973 DVE outbreak resulted in casing destruction and new casing had to be installed. The new casing reduced the well opening from 12" to 8" and dropped the flow to approximately 450 gpm.

In 1986, Ducks Unlimited funded the drilling of a new 12" artesian well and the old well was capped. The new well has a 800-1000 gpm flow. The well distribution box and pipeline supplying the Prairie Ponds were also replaced. In 1987 the four water control structures on the prairie ponds were retrofitted with new screw gates for better water control.

II. Objectives

Owens Bay water management objectives are to store annual runoff and artesian well water to be used primarily as waterfowl habitat. Waterfowl production is the primary objective on Owens Bay. The emphasis is on providing excellent breeding pair habitat and permanent brood water. Secondary objectives include providing waterfowl migrational habitat and benefits for marsh and water birds, shorebirds, gulls, terns, and resident wildlife.

III. 1987 Water Conditions

The winter of 1986-87 was mild and open. Snowfall for the period January through March was only 2.5 inches. Spring runoff from snow pack was well below normal. However, heavy rains in March yielded 7.7 inches of rainfall and provided excellent runoff. Owens Bay filled to capacity.

On March 16, a gradual draw-down was begun on Owens Bay. The artesian well flow was lowered and cycled through the prairie ponds into Lake Andes. Owens Bay had not been drawn down since 1973-74. Since then it had been held at full pool when possible. By September the bay had drained as low as possible but, 150 acres of 6-8" deep sheet water remained. Because of a sediment buildup between the outlet structure and the main pool it was impossible to completely drain the main pool without blasting a trench or using specialized equipment to dig a trench.

Total precipitation in 1987 was 25.46" which is well above the 21.37" average.

1987 Water Levels - Owens Bay

<u>Date</u>	<u>Water Level</u>
03/16	Top board in structure pulled
03/22	1442.52
03/19	1442.72
05/01	1441.60
06/01	1440.60
07/07	1439.69
07/31	1437.50
08/04	1437.10
09/03	1436.52 drained

IV. Ecological Effects of the Past Years Levels on Owens Bay

The number of waterfowl pairs on Owens Bay in 1987 (244 pairs) was up by 78% from the 137 counted in 1986.

Owens Bay provided good brood habitat throughout most of the drawdown although emergent escape cover was lacking. On August 25, an outbreak of botulism was discovered in the waterfowl using the unit. By September 15, an estimated 750 birds were lost, primarily blue-winged teal and mallard. Extreme hot weather during this period created the correct anaerobic conditions necessary for the botulism bacteria to thrive.

V. 1988 Water Management Objectives

Water management activities for 1988 are to contain as much runoff as possible in Owens Bay. The artesian well will continue to run at full flow in order to offset annual evaporation.

The prairie ponds will be drawn down in April prior to a rotenone treatment which will be used to eliminate any existing fish populations. Management plans are to introduce northern pike and largemouth bass into Owens Bay and use it as a stocking source for Lake Andes.

WATER UNIT: Broken Arrow Waterfowl Production Area

I. Introduction

The Broken Arrow WPA is a 2650 acre tract in Douglas and Charles Mix Counties, SD. Two drainage systems existed on the property when purchased. The Mud Lake Drain has an upstream watershed of 25,600 acres, while the second system, the Joubert Drain, has a 12,320 acre watershed. Five ditch plugs or low head dams, with concrete stop-log control structures, were installed in 1979 along the drainage ditches, two on the Mud Lake ditch and the remaining three on the Joubert drain. Dam #6 was constructed below dam #2 on the Mud Lake drain in 1984. Dam #7 on the Joubert Drain was constructed during the fall of 1986 in cooperation with Ducks Unlimited who funded the project design and construction. A water rights permit for the storage of 131.2 acre feet of water was granted by the South Dakota Department of Water and Natural Resources. The impoundment at capacity covers 56.4 surface acres. The development increased the quantity of pair habitat by creating 5.9 miles of shoreline. The maximum depth is 6.5 feet. Design specifications for the seven dams are as follows.

Embankment Volume YD ³	High Water Contour	Surface Acres	Acre-feet Impounded
Dam #1 - 76	Unk	6.2	5.7
Dam #2 - 755	Unk	27.9	82.6
Dam #3 - 2761	Unk	43.6	163.0
Dam #4 - 586	Unk	34.7	88.3
Dam #5 - 137	Unk	6.3	5.2
Dam #6 - 900	Unk	30.0	Not determined
Dam #7 - 5470	1526.0	<u>56.4</u>	<u>131.2</u>
TOTAL		205.1	476.0

The capability to manipulate water levels is very limited on the Broken Arrow WPA. Impoundments can be drawn down as objectives dictate. However, to reflood depends on spring runoff and no capability to flood when desired is possible.

II. Objectives

The storage of annual runoff in impoundments to be used primarily as waterfowl production habitat. The habitat provided also benefits marsh and water birds, shorebirds, gulls, terns, and raptorial birds. Secondary benefits are provided to resident wildlife and livestock used for management purposes. Water excess to storage needs is allowed to drain through the system.

III. 1987 Water Conditions

The winter of 1986-87 was mild and open. Snowfall for the period January through March was only 2.5 inches. Spring runoff from snow pack was well below normal and all impoundments were below full pool level. Heavy rains in March yielded 7.7 inches of rainfall and provided excellent runoff. All units filled to capacity including the new 56 acre DU impoundment and approximately 25 additional acres of wetlands that had excess water channeled into them by the project. The top two feet of boards on the DU impoundment structure were pulled to maintain lower levels during the first year of operation. This gave the newly constructed dikes a season to vegetate. The months of April, May and June were fairly dry with only 3.38 inches of precipitation. By late summer both drains had very little flow and water levels were reduced by evaporation. Total precipitation for 1987 was 25.46 inches which is 4.09 inches above normal.

IV. Ecological Effects of the Past Years Water Levels on the Broken Arrow WPA

Water levels were excellent in all pools. However, because carp have become established, poor water quality diminished production by hydric plant species and resulted in poor quality brood habitat.

In October the stoplog structure in dam #6 was lowered approximately 2 feet. This allowed a complete draw down of pools 2 and 6 to eradicate the carp.

Waterfowl response to the newly flooded impoundments was high. Many broods of mallard and blue-winged teal were raised on the new units. Little waterfowl use was noted in the carp infested pools.

V. 1988 Water Management Objectives

Water management objectives for 198⁴ are to contain as much spring runoff as possible on the unit. In August the feasibility of a fall draw down of dams #3 and #4 will be evaluated. If we are not experiencing a drought situation and thus a natural draw down then those units will be drained and not filled until spring 1989 depending on runoff.

The original cement water control structures with slide gates will be retrofitted with new screw gates when conditions permit on dams #2, #3 and #4.

A low level dike in Section 8 will be repaired. This dike impounds water that normally leaves FWS land and runs into a nearby drainage ditch. Water has over-topped and damaged the dike.

WATER UNIT: Karl E. Mundt National Wildlife Refuge

The Karl E. Mundt NWR borders the Missouri River in Gregory County. The refuge was established in 1974 to protect habitat important to wintering bald eagles. The only water on the unit itself are four small (less than 1 acre) stock ponds that are used in conjunction with the grazing program. There is also a free-flowing artesian well that provides water for a small 1/2 acre pond.

There presently is no active management of water on the Karl E. Mundt Refuge.